

Review of the Draft Species Report- Fisher (*Pekania pennanti*), West Coast Population and the accompanying proposed rule to list the West Coast Distinct Population Segment of the Fisher as a threatened species under the Endangered Species Act

The draft species report and the resultant proposed rule (documents) address the scope and severity of several natural and anthropogenic stressors that may threaten the west coast distinct population of the fisher (*Pekania pennant*). The documents provide sound justification for the methods and conclusions by drawing on scientific information and by acknowledging the uncertainties that arise due to the secretive biology of fishers, clandestine marijuana cultivation sites, data gaps on exposure and direct and indirect effects of pesticides to fishers, spacio-temporal variations in the scope and severity of the individual threats across the fisher's range, and the interactions among the various stressors.

However the severity of the toxicant stressor is underestimated because the assessment is based on only one endpoint: adult mortality. Though the impact of sublethal effects may not be quantifiable at this time, consider including an estimate of the indirect effects (e.g. kit mortality following maternal mortality), given that parental care is provided only by female fishers, pesticide use at marijuana cultivation sites occur during the breeding period of fishers, and Gabriel et al. (2012) documented 100% kit mortality from abandonment due to maternal poisoning with anticoagulant rodenticides (ARs).

Additional discussion on the uncertainties and limitations of using only one endpoint for the toxicant stressor assessment may emphasize the importance of the Toxicant threat assessment. For example, possible points for additional discussion include 9, 10, 11, 18, and 20 below.

This review focuses on the threat of pesticides to the fishers. The main source of poisoning is from indiscriminant pesticide applications at illegal marijuana cultivation sites on public lands. The documents use a systematic approach, based on ecotoxicology principles to characterize the threats to fishers. The documents discuss the sources of exposure (legal and illegal application), routes of exposure (direct and secondary poisoning), residue measurements, pesticide toxicity, mode of action, time courses of adverse effects, types of adverse effects (direct and sublethal), overt and physiological signs of exposure, and the actual incident evidence.

Below are some recommendations for future revisions of the documents.

1. Page 152 – Consider adding the following to the draft species plan: Ruder MG et al. 2011. Intoxication of nontarget wildlife with rodenticides in northwestern Kansas, *Journal of Wildlife Diseases*. 47:212-216. Whereas the Quinn publication cited in the draft species report documents badger mortality from second generation anticoagulant rodenticides, the Ruder publication is the first published documentation of a badger mortality from chlorphacinone, a first generation rodenticide.
2. Page 152- Consider adding the following to the draft species plan: Fisher DD and Timm RM. 1987. Laboratory trial of chlorphacinone as a prairie dog toxicant. *Wildlife Damage Management, Internet Center of Great Plains Wildlife Damage Control Workshop Proceedings*. University of Nebraska, Lincoln. 67-69. This publication documents chlorphacinone secondary poisoning of ferrets.
3. Page 152 - In addition to the signs of AR poisoning listed, add bleeding from anus and vagina (see Brakes and Smith 2005). Signs of AR exposure also include discolored

(usually blue or green) droppings and discoloring around mouth, belly, and paws of exposed animals. Discoloration is from the dye used to color AR products. I have come across carcasses showing bleeding from the anus as the only overt sign of AR poisoning and found discolored mammalian and avian droppings and prairie dogs with green colored fur in areas treated with chlorophacinone. Vyas, NB et al. 2012.

Chlorophacinone residues in mammalian prey at a black-tailed prairie dog colony.

Environmental Toxicology and Chemistry. 31:2513–2516. Vyas, NB et al. 2013.

Evidence of songbird intoxication from Rozol® application at a black-tailed prairie dog colony. Journal of Fish and Wildlife Management. 4:97-103.

4. Page 153 – Some citations in support of selective predation on substandard prey (including poisoned prey) that may be include in the draft species report include: Galindo JC et al. 1985. The effect of methyl parathion on susceptibility of bobwhite quail (*Colinus virginianus*) to domestic cat predation. Behavioral and Neural Biology 43: 21–36. Temple S.A. 1987. Do predators always capture substandard individuals disproportionately from prey populations? Ecology 68: 669-674. Taylor I. 2009. How owls select their prey: a study of barn owls *Tyto alba* and their small mammal prey. Ardea 97:635-644.
5. Page 159 - Please provide AR residue concentrations by chemical from the fishers.
6. Page 162 – Table states that methomyl exposure to fishers is not documented, but Gabriel et al. (2013) reported a fisher mortality from a methomyl-laced hotdog (cited on page 160 of the draft species report).
7. Move table heading to top of table.
8. Table 25 - Please clarify: Column heading Illegal/Legal Use can be misleading and the column may be unnecessary. First, the pesticide label is a legal document that must be followed by the applicator. The label on or with the pesticide container lists the specific pests on specific use sites (e.g. corn, around buildings, etc.) that can be controlled by that product. If the label is not followed, the applicator is in violation of the Federal Insecticide, Fungicide, and Rodenticide Act. For example, an applicator violates the Federal Insecticide, Fungicide, and Rodenticide Act if he/she applies a registered pesticide without regard to the application rate specified on the label or applies the registered pesticide on a crop or pest not specified on the label. Since none of the pesticides listed in Table 25 are registered for use on marijuana, all pesticides in Table 25 are in the Illegal Use category and therefore, the column is not necessary. However, if the intent of the column in Table 25 is to identify which pesticides are currently registered by EPA for use somewhere and on something in the US, then instead of the Illegal/Legal Use heading, the Registered/Not Registered heading may be considered but with a footnote that the Registered/Not Registered column does not imply registered for use on marijuana. Regardless whether the pesticide is registered or not, all uses at a marijuana cultivation site belong in the Illegal Use category of the column.
9. Page 161 - The calculation of the number of prey items to reach the LD50 is based on the application rates listed on the pesticide label. Given that there is no label for use on marijuana and the fact that these are illegal plantings, it is reasonable to state that application rates and methods on the label and best pesticide management practices are not followed. Therefore, in addition to encountering very high pesticide concentrations in laced baits or at spillage sites, the pesticide concentrations in prey can be much greater

- than those measured in prey following label applications. It is therefore important to stress that a fisher may need to forage on fewer animals before succumbing to poisoning.
10. Page 164 – The inclusion of the consequences of sublethal effects is important and should be expanded. Consider consulting veterinarians and wildlife rehabilitators who receive live AR poisoned animals (raptors, dogs, cats, etc.) for details about the animal's behavior which then, can be related to their fates if they had remained untreated in the wild.
 11. Page 165 – Gabriel et al. (2012) documented 100% kit mortality from abandonment due to maternal poisoning with ARs. These losses are significant for fishers as shown by Thompson et al. 2014 (cited on page 165 of the draft species report. Consider including kit mortality in the severity calculations.
 12. Page 166- Please justify the use of 95% scope.
 13. Page 167 – Please list the ARs and their residue concentrations from the reintroduced fisher carcasses in Washington. Also, please specify when the reintroductions occurred and when the carcasses were found. Depending on the AR and its half-life and the time period between reintroduction and carcass recovery, it may be possible to determine if any of the fishers died from exposure in Washington after the reintroduction.
 14. Page 167 – A comparison of residue concentrations of fishers from the state of Washington and those found in marijuana cultivation sites is useful. If the Washington fishers were poisoned from an urban source, it is possible that the AR applications were conducted according to the label, therefore their residues may be different from the fishers in marijuana cultivation sites. On page 160, Gabriel et al. (2012a) reported an inability to determine a hepatic residue threshold for mortality because of the high variability and overlapping of residues in fishers from marijuana cultivation sites. This may be an artifact of the indiscriminant pesticide applications at marijuana cultivation sites. For example, Mineau and Tucker (Mineau P and Tucker KR. 2002. Improving detection of pesticide poisoning in birds. *Journal of Wildlife Rehabilitation* 25:4-13) also showed high variability and overlapping of residues from the gastrointestinal tracts of raptors killed by carbofuran and concluded that the residue concentrations could not be used to distinguish between mortalities resulting from legal or illegal use of the insecticide. However, unlike carbofuran, some ARs are likely to bioaccumulate because they exhibit long half-lives. Therefore, it may be possible that the range and variability of AR residue concentrations could help determine if the fisher mortalities occurred from legal or illegal applications of the pesticides.
 15. Brakes and Smith (2005) reported that non-target small mammal populations declined after AR application but partially recovered after 3 months. If there is a similar decline in prey at the marijuana cultivation sites and if fisher AR residues are fairly high, it may imply that the main source of poisoning is from laced baits. See comment 13 for importance of reporting residue values.
 16. Page 167 - Please show the basis for 69% and 82%.
 17. Page 169 – Please provide justification for considering stressor interactions as synergistic. Outcomes of interactions may occur via synergism, additivity, and potentiation. Please explain why the stressor interactions were not additive or potentiated. Or perhaps use 'compounded effects' to include all three processes.
 18. It is important to highlight the value of the pesticide-related fisher mortalities by explaining that the significance of the incident data can only be appreciated when placed

in context with the challenges in obtaining the data. Mortality reports from the field confirm the hazards of pesticides to fishers. Determination of the adverse effects of pesticides on fishers is contingent on the quality of the samples collected, which in turn is affected by how soon and how thoroughly an investigation occurs after the onset of a mortality event. The vastness of areas within which the marijuana cultivation sites are secluded limit detection of affected fishers. Public reportings of mortalities are limited by uncertainty as to whether the incident should be reported and to whom it should be reported, fear of reprisals in the case of marijuana growers, fear of prosecution, procrastination, and apathy. Even when a mortality incident is reported to the appropriate authorities, an immediate investigation may not be possible because of the distance, terrain, weather, private property restrictions, limited resources, and other on-going investigations. Delays in the discovery, reporting, and investigation of a mortality incident increase the time interval between mortality and carcass collection, which in turn, increases the chances of compromising the quality of the evidence through scavenging and decomposition. Consequently, when a carcass is recovered during a field investigation, the biological and chemical matrices which are used to confirm the cause of death may not be in analyzable condition. The loss of these matrices introduces uncertainty in determining the cause of death. Exposure to multiple stressors can also complicate the determination of the cause-effect relationship. The current incident reports that implicate pesticides as the cause of death are the tip of the iceberg of pesticide effects on fishers. The iceberg tip includes only those incidents that have been detected, reported, and confirmed. The iceberg tip, though small in comparison to the rest of the iceberg, represents our current knowledge on the effects of pesticides on fishers. Given the obstacles in documenting incidents, the few known mortalities nevertheless provide an invaluable window into the hazards of pesticides to fishers. Therefore, it is reasonable to conclude that on a landscape scale, the fisher exposures to pesticides, especially in marijuana cultivation sites, result in fisher mortalities and that the number of fishers killed exceeds the carcasses that have been recovered. The paucity of fisher incident data does not imply a lack of hazard from pesticides, but highlights insufficient monitoring for adverse effects. For a review of the challenges of finding carcasses, please see Vyas, NB. 1999. Factors influencing the estimation of pesticide-related wildlife mortality. *Toxicology and Industrial Health*. 15:186-191. For a review of the widespread cultural practices of using laced baits, please see Vyas, NB et al. 2003. Pesticide-laced predator baits: considerations for prosecution and sentencing. *Environmental Lawyer* 9: 589-608.

19. Page 169 – It is not clear how the percent annual mortalities of 3-17% and 6-32% were determined in Tables 33b and 34b. Please clarify how the numbers were derived in the example.
20. One variable contributing to the severity of toxicants that should be considered is that marijuana cultivation sites may serve as fisher population sinks. Fishers may be attracted to marijuana cultivation sites because foraging on laced baits and poisoned prey may minimize their energy expenditure and maximize their net energy intake.

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